[0079] On a receiving substrate **58** made of silicon, for example (or glass, ceramic, etc.), a Bragg mirror is produced by dielectrically depositing thin films with different refraction indices (**FIG. 4B**). In this example, the Bragg mirror is the same as in the previous example. In this case, it is a SiO_2 layer that is first deposited on the Si receiving substrate.

[0080] The Bragg mirror **60** on its silicon substrate **58** is then bonded to the initial substrate **51** (**FIG. 4C**) by molecular adhesion. The bonding by oxide-oxide molecular adhesion of the SiO_2 layer **57** of the initial substrate with a SiO_2 layer provided on the Bragg mirror **60** can then be carried out without a phase-shifting step (the thickness is equal to $\lambda/2$).

[0081] It is specified that the mirror is completed with a Si_3N_4 layer because the stacking was started with a SiO_2 layer.

[0082] As in the previous example, the (incomplete) removal of the GaAs supporting substrate **53** is performed by thinning the supporting substrate until a bonded structure with a thin GaAs film **53***a* on its surface is obtained (**FIG. 4D**).

[0083] When it is ready for epitaxy, the bonded structure is placed in the epitaxy apparatus and the thin GaAs film **53***a* is evaporated (**FIG. 4E**).

[0084] Finally, the epitaxial growth of at least one layer (active layer) on the first material AlAs layer **52** is carried out.

[0085] The last two examples presenting a Bragg mirror **40**, **60** will enable so-called resonant cavity structures to be produced. The principle of so-called resonant cavity structures consists of interposing an active layer that transmits or detects light between two reflecting mirrors or Bragg mirrors. The reflectivity of the mirrors used is generally relatively high (>95%). Some common examples of resonant cavity structures include vertical cavity surface-emitting lasers (VCSEL) or resonant cavity photodetectors.

[0086] The active layer is generally produced by epitaxy of an active material on a single crystal support. The problem lies in particular in the fact that the single crystal support in this case is the lower mirror which itself is commonly produced by epitaxy on a substrate. However, given the desired reflectivity of the mirrors (>95%), it is necessary to produce so-called "quarter wave" Bragg mirrors, in which the semiconductor layers forming the mirror have an optical thickness four times less than the wavelength at which the mirror must reflect light. The layers forming the Bragg mirror must therefore have very specific thicknesses. In addition, to obtain high reflectivity and taking into account the minor differences in indices observed between the materials commonly used and compatible with one another (for example 2.9 for AlAs and 3.5 for GaAs at 1.3 micrometers), the number of alternations n is generally high (over 20). It is noted that a Bragg mirror is formed by a number n of bilayers with different indices n_1 and n_2. This high number of alternations is detrimental and makes it necessary to have complete control over the epitaxy.

[0087] Moreover, for the resonant cavity structure to be of high quality, the precision of the thickness of the layers, in particular those close to the cavity, is important: this precision must be around 1 percent.

[0088] The method according to the invention makes it possible to eliminate the step of epitaxial growth of a lower Bragg mirror, which growth is difficult and limiting.

[0089] In addition, some materials, such as InP, for example, do not make it possible to grow the materials forming effective Bragg mirrors by epitaxy. It is then necessary to transfer, using bonding techniques, mirrors produced in other ways in order to benefit from the advantages of the different materials. However, to be effective, the active layer, with generally has a thickness of around 1 micrometer, must be located as close as possible to the Bragg mirrors. The step of bonding, in particular the active layer, must therefore be perfectly controlled, which is very difficult.

[0090] By using the method according to the invention, these disadvantages are avoided because the bonding is carried out before the epitaxy of the active material. This method may make it possible to obtain a precision on the thickness of the layers that is compatible with the requirements of the components (i.e. around 1 percent).

[0091] To form the lower or upper mirror, dielectric materials (for example Si/SiO_2) are preferably used because this makes it possible to reduce the number of alternations necessary to obtain a Bragg mirror with high reflectivity. For example, to obtain the same reflectivity, a Bragg mirror can be made using 5 Si/SiO_2 bilayers instead of 25 GaAs/AlAs bilayers. This is because the Si/SiO_2 system has a greater index difference between these components.

[0092] We will now describe in detail the production of a resonant cavity structure including an active layer between a lower Bragg mirror and an upper Bragg mirror made of Si_3N_4/SiO_2. This active layer can consist of a GaAs/GaInAsN stack or an alloy including Ga, In, N, Al, As, P, Sb.

[0093] By following the steps shown in **FIGS. 3A-3D** (or **4A-4D**), a bonded structure is obtained, comprising a Si receiving substrate **8** (serving as a mechanical support) with a stack including a silica layer **9**, a Bragg mirror **40** consisting of an alternation of Si_3N_4/SiO_2 bilayers, a GaAs layer **4** (additional layer), a AlAs layer **2** (first material barrier layer) and a thin GaAs film **3***a* (second material layer). This bonded structure is placed in an epitaxy apparatus and the thin GaAs film **3***a* is evaporated (**FIG. 3E**). The AlAs barrier layer **2** is then exposed and the epitaxy can be started on this layer. In this case, the epitaxy of one or more active layers on the AlAs layer **2** is performed on top of a Bragg mirror with complete control over the thicknesses. The control is achieved by means of the AlAs layer which has an evaporation temperature higher than the second material layer, which in this example is made of GaAs.

[0094] Once the cavity is formed by the deposition of the active layer, the upper dielectric mirror including Si_3N_4/SiO_2 bilayers simply has to be deposited, for example, by PECVD. The active layer can be formed, for example, by a GaAs/GaInNAs stack.

[0095] The two mirrors are preferably dielectric (Si/SiO_2, HfO_2/SiO_2, TiO_2/SiO_2 and so on). The two mirrors are not necessarily identical.

[0096] The technological method is then carried out. For more details on this method, reference can be made to document [2].